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The identity of two species in the genus *Sisyphus* (Coleoptera: Scarabaeidae)

by

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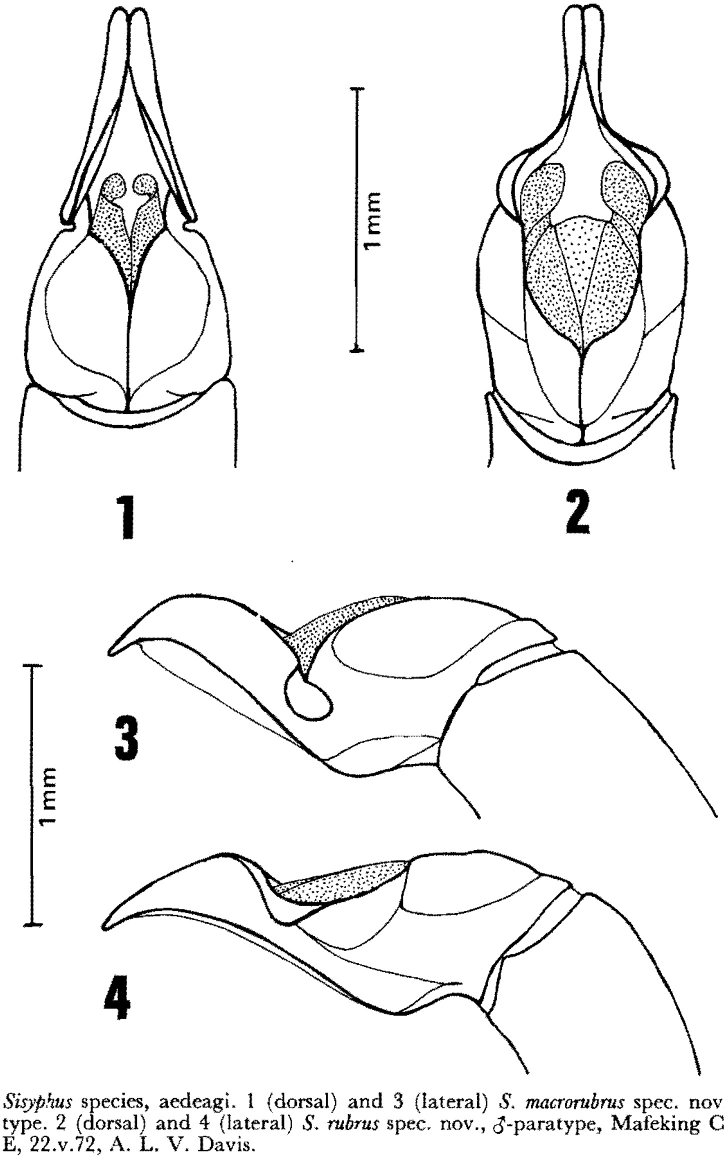
The name, *S. rubrus* is provided for the new species, *S. rubripes* of authors not Boheman. The species, *S. macrorubrus* is discussed and its close morphological and biological connections with *S. rubrus* are indicated.

This paper is a preliminary to a complete revision of the taxonomy of the genus *Sisyphus* Latreille 1807 in southern Africa. A survey of the behaviour, biology and ecology of these species is also in progress. The study of this genus was undertaken for a project of the Australian Commonwealth Scientific and Industrial Research Organization, Division of Entomology. The aim of the CSIRO project is to establish a dung beetle fauna in Australia which will control dung-breeding flies by burying the dung pads. Dung beetles from continents other than Australia had to be sought since the local species are not efficient in the burial of bovine dung (Bornemissza 1960). A unit under Dr G. F. Bornemissza was established in Pretoria to study the various genera of dung beetles in Africa, Europe and Asia. The publication of these new species names will make subsequent references in this study of the genus *Sisyphus* less confusing.

Sisyphus rubrus spec. nov., figs 2 and 4

Sisyphus rubripes Boheman *sensu* Péringuey, 1902: 101–2.
Sisyphus rubripes Péringuey in Arrow, 1927: 461, 464; Haaf, 1955: 370–1; Ferreira, 1972: 829, 831, 834.

S. rubrus is the name given to the new species incorrectly identified and described by Péringuey in 1902 as *rubripes* Boheman 1857. Arrow (1927) stated that Péringuey's supposed description of *rubripes* Boheman was actually of *appendiculatus* Boheman and referred to Péringuey's description as being that of "*rubripes* Péringuey". Haaf (1955) realized that Péringuey's description was of an unnamed species and redescribed it after designating a lectotype from Péringuey's material in 1954. Haaf (1955) and Ferreira (1972), however, continued to refer to the new species as "*rubripes* Péringuey". Examination of the material at hand, of *rubripes* Boheman (holotype); *appendiculatus* Boheman (♂ specimen with determination in Boheman's handwriting); specimens determined by Péringuey as *rubripes* Boheman and then by Haaf in 1954, as "*rubripes* Péringuey" and Haaf's supposed lectotype of "*rubripes* Péringuey", confirms Haaf's decision on the status of Péringuey's material. However, since the name *rubripes* was already occupied in the genus *Sisyphus* by Boheman, its use by Arrow (1927), Haaf (1955) and Ferreira (1972) for the species described by Péringuey, was not permissible. The species name *rubrus*, is therefore provided for this new species which was adequately described but incorrectly identified as *rubripes* Boheman by Péringuey (1902).



Figs 1–4 *Sisyphus* species, aedeagi. 1 (dorsal) and 3 (lateral) *S. macrorubrus* spec. nov., ♂-holotype. 2 (dorsal) and 4 (lateral) *S. rubrus* spec. nov., ♂-paratype, Mafeking C.P., 9 mi E, 22.v.72, A. L. V. Davis.

The status of *rubripes* Boheman and *appendiculatus* Boheman will be discussed elsewhere.

MATERIAL EXAMINED. ♂-Holotype, South Africa: Castle Gorge, Tvl. 42 mi W Pretoria, 15.V.1971, Bornemissza and Insley. 94♂– and 65♀– paratypes with the following collection data: SOUTH AFRICA: Durban, Natal, iii.1888, (1♀), "*S. rubripes* Pér., Lectotype, det. E. Haaf, 1954"; Castle Gorge, Tvl, 42 mi W Pretoria, 15.v.1971, Bornemissza and Insley (12 ♂, 6 ♀); Castle Gorge, Tvl. 42 mi W Pretoria, 19.vi.1971, Bornemissza and Insley (7 ♂, 6 ♀); Bergen, S.E. Tvl, 1.vi.1972, A. A. Kirk (2 ♂, 1 ♀); Louis Trichardt, Tvl, 11 mi S, 4.xii.1971, K. M. Olsen (2 ♂, 4 ♀); Bosbokrand Bridge, 5 mi N, E. Tvl, 6.ii.1971, Bornemissza and Aschenborn (36 ♂, 25 ♀), (*S. rubripes* Péringuey, det. Ferreira, 1972); Bosbokrand, E. Tvl, 6.ii.1971, Bornemissza and Aschenborn (21 ♂, 15 ♀), (*S. rubripes* Péringuey, det. Ferreira, 1972); Vryburg, C.P., 15 mi. E = Leeuwrand Farm, 7.x.1972, R. Kluge (1 ♂); Mafeking, C.P., 9 mi E, 22.v.1972, A. L. V. Davis (1 ♂); Aliwal North, C.P., 22 mi S, 4.iii.1971, H. H. Aschenborn (2 ♂); Umtata, Transkei, 10 mi N, 19.v.1971, H. H. Aschenborn (2 ♂, 3♀); Vredefort, O.F.S., 20 mi S, 3.xi.1971, Bornemissza and Kirk (2 ♂, 1 ♀); MOZAMBIQUE: Vila Pery, 5 mi E, 10.iv.1971, Bornemissza and Aschenborn (1 ♂, 2 ♀); RHODESIA: Sebakwe, 1901, D. Dods (2 ♂), det. Péringuey as *rubripes* Boheman, det. Haaf, 1954, as *rubripes* Péringuey; Sebakwe, 1902, D. Dods (3 ♂, 1 ♀), det. Péringuey as *rubripes* Boheman, det. Haaf, 1954, as *rubripes* Péringuey. Holotype and paratypes in National Collection of Insects, Plant Protection Research Institute, Pretoria and paratypes in South African Musuem, Cape Town. ADDITIONAL MATERIAL. UNKOWN LOCALITY: "*Sisyphus rubripes* Boh." (2 ♂, 1 ♀) det. Péringuey, det. Haaf 1954 as *rubripes* Péringuey, in South African Museum, Cape Town; VARIOUS LOCALITIES: 779 specimens, in CSIRO collection, Pretoria.

Sisyphus macrorubrus spec. nov., figs 1 and 3

This species has been considered to be the same as *S. rubrus*, as seen in material at hand from the Orange Free State, identified by Ferreira (1972) and Haaf (1954). *S. macrorubrus* is a sibling species of *rubrus* and has the same morphological characters as described for that species (Péringuey 1902: 101–2) with the exception of the aedeagus (compare figs 1 to 4) and a difference in the range of body length (Table 1).

TABLE 1. Mean and range of body length (from mid-anterior edge of clypeus, head deflexed, to end of elytra) in *S. rubrus* and *S. macrorubrus*.

Species and Sex	Mean	Range	No. of Individuals Measured
S. rubrus ♂	7,55 mm	6,6– 9,0 mm	153
S. rubrus ♀	7,78 mm	6,5– 9,5 mm	93
S. macrorubrus ♂	9,11 mm	7,2–10,2 mm	74
S. macroruburs ♀	9,12 mm	7,8–10,0 mm	42

Careful viewing under the scanning electron microscope and binocular microscope revealed no further specific differences. *S. macrorubrus* females, therefore, if within the *rubrus* size range, cannot be distinguished from that species. The males can be separated by comparing the aedeagi.

Their behaviour and biology also seem identical but *macrorubrus* has a different distribution. Most specimens of *S. rubrus* have been found almost throughout Natal, Transvaal, Eastern Cape, Transkei, N.E. Cape and the Orange Free State in South Africa and in some areas of Rhodesia, Mozambique and Kenya. *S. macrorubrus* has been found mostly in the Orange Free State, sometimes sympatrically with *rubrus*. This suggests that *rubrus* and *macrorubrus* are not just geographical varieties. *S. macrorubrus* also occurs in and near the Etosha Game Reserve in S.W. Africa and in the Cape Province near the O.F.S. border, where it tends to spread into the northern and central Cape.

Attempts were made to crossbreed *rubrus* and *macrorubrus*. All females used were newly emerged and unmated before pairing, which took place within 24 hours of emergence. Sizes of individuals paired were as similar as possible and differences in size were not more than those differences within the size range for one species. Not all pairs were reared simultaneously and the period of observation varied. The number of eggs recorded per pair in Table 2 cannot, therefore, be compared. Fertility of eggs was based on whether they hatched or contained a developing embryo.

TABLE 2. Results of attempted crossbreeding of *S. rubrus* and *S. macrorubrus*.

Pair No.	Combination of Species Used	Total No. of Eggs Laid	No. of Eggs Fertile
1	*macrorubrus* ♀ + *rubrus* ♂	25	0
2	” ” ” ” ”	5	0
3	” ” ” ” ”	4	0
4	*rubrus* ♀ + *macrorubrus* ♂	3	0
	Total no.: male + female of different species:	37	0
5	*macrorubrus* ♂ + *macrorubrus* ♀	18	18
6	” ” ” ” ”	6	6
7	*rubrus* ♂ + *rubrus* ♀	14	13
8	” ” ” ” ”	15	14
	Total no.: male + female of same species:	53	51

These results indicate that the males of one species were not able to fertilize the eggs of the other species. The following observation showed that these two species are, however, biologically similar. In females of both species there is an initial period after emergence when the insects feed. Between eight and 28 days after emergence, the first egg is laid. If unmated females are isolated for a long period they may produce a few infertile eggs but only well after 28 days from emergence. If an individual of *rubrus* or *macrorubrus* is paired with an individual of a third species, a few infertile eggs may be produced after 28 days as with the isolated, unmated female. In the pairs 1 to 4, recorded in Table 2, however, all females started laying eggs well within 28 days. This indicates that there is some stimulation for oviposition by the "foreign" male (in *rubrus* and *macrorubrus*) but the male is not able to fertilize the eggs. *S. rubrus* and *S. macrorubrus* therefore, although biologically very similar, are valid species.

MATERIAL EXAMINED. ♂-Holotype, SOUTH AFRICA: Vanstandensrus, O.F.S., 10.xii.1971, A. A. Kirk. 33 ♂- and 23 ♀-paratypes with the following collection data: SOUTH AFRICA: Zastron, O.F.S., 2 mi W, 3.iii.1971, H. H. Aschenborn (2 ♂, 3 ♀); Zastron, O.F.S., 21 mi N, 12.v.1972, K. M. Olsen (1 ♂, 1 ♀); Wepener, O.F.S., 22 mi N, 11.v.1971, H. H. Aschenborn (1 ♂, 2 ♀); Wepener, O.F.S., 19 mi. S, 11.v.1971, H. H. Aschenborn (1 ♂); Wepener, O.F.S., North, 3.iii.1971, H. H. Aschenborn (2 ♂, 1♀); Ladybrand, O.F.S., 16 mi S, 2.iii.1971, H. H. Aschenborn (2 ♂, 2 ♀); Ladybrand, O.F.S., Maseru Rd., 27.xi.1970, Bornemissza and Aschenborn (5 ♂, 2 ♀); Caledon Riv., O.F.S., 3 mi W Maseru, 2.iii.1971, H. H. Aschenborn (3 ♂, 2 ♀); Bloemfontein, O.F.S., 11 mi N, 3.xi.1971, Bornemissza and Kirk (1 ♂, 2 ♀); Rouxville, O.F.S., 1.xi.1971, Bornemissza and Kirk (1 ♂, 1 ♀); Vryburg, N.C.P., 24 kms SW, 8.xi.1973, I. D. Temby (1 ♂); Kimberley, C.P., 25 mi S, 14.x.1971, Bornemissza and Kirk (1 ♂); Aliwal North, C.P., 8 mi W, 3.iii.1971, H. H. Aschenborn (2 ♂, 1 ♀); Aliwal North, C.P., North, 3.iii.1971, H. H. Aschenborn, (2 ♂, 1 ♀); Aliwal North, C.P., 6 mi S, H. H. Aschenborn (5 ♂); Aliwal North, C.P., East, 3.iii.1971, H. H. Aschenborn (2 ♂, 2 ♀); SOUTH WEST AFRICA: Outjo, 15 kms N, 10.iv.1974, H. H. Aschenborn (1 ♂, 3 ♀). Holotype and paratypes in the National Collection of Insects, Plant Protection Research Institute, Pretoria and paratypes in South African Museum, Cape Town. ADDITIONAL MATERIAL: SOUTH AFRICA: 68 specimens, various localities, CSIRO Collection, Pretoria; Ladybrand, O.F.S., Maseru Rd., 27.xi.1970, Bornemissza and Aschenborn (1 ♂), det. Ferreira 1972 as *rubripes* Péringuey, in CSIRO Collection; Smithfield, Orange River Colony, Kannemeyer, (1 ♂) det. Haaf 1954 as *rubripes* Péringuey, in South African Museum, Cape Town.

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